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EXAMINER	
RICE, ELISA M	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/823,674	LEE ET AL.	
	Examiner	Art Unit	
	ELISA M. RICE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18,20 and 21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18,20 and 21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-9, 11-17 and 18, 20, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Heising.

Regarding claims 1 and 9, Choi discloses a block-based motion compensation apparatus comprising: a first motion compensation interpolator to read a first and a second pixel corresponding to a motion vector of an estimated current block respectively from a current and a previous frame or field inputted, and to calculate a first interpolation pixel; at least one second motion compensation interpolator to read a third and a fourth pixel corresponding to a motion vector estimated with respect to each of at least one peripheral block adjacent to the current block to be interpolated respectively from the inputted current and previous frame or fields (Choi, page 606, left column, lines 8-16; equation 10), and to calculate a second interpolation pixel; a candidate interpolation pixel calculator to calculate a candidate interpolation pixel by allocating a predetermined weight to the first and the second interpolation pixels according to

relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated (Choi, equation 12 wherein the weight is 0.5); a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous; and a final interpolation pixel selector to select one among the first interpolation pixel and the candidate interpolation pixel as a final interpolation pixel according to the result determined at the motion analyzer, and to output the selected final interpolation pixel (Choi, page 606, paragraph 1 on the right-hand side; equation 11-13; Fig. 7).

Choi does not disclose the following:

1) allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated;
2) a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous;
3)a final interpolation pixel selector to select according to the result determined at the motion analyzer

Heising teaches allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated (Heising, page 95, left-hand side, lines 15-21, page 95, Fig. 2a and equation 3); a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks 9 (Heising, page 95, right column, lines 29-34, page 95, equation 4), and to determine whether the current block and the peripheral blocks are continuous; and a final interpolation pixel selector to select according to the result determined at the motion analyzer (Heising, page 95, right column, lines 35-36 and according to page 99, right column, lines 12-18 and page 100, left column, first paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Choi with the method of using a predetermined weighting, a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks and to determine whether the current block and the peripheral blocks are continuous, and subsequently a final interpolation pixel selector to select according to the result determined at the motion analyzer as taught by Heising for the objective of "significantly improving coding efficiency as well as visual quality" (Heising, page 93, first paragraph).

Regarding claims 3 , 5, 11, and 13, the combination of Choi and Heising discloses the motion compensation apparatus of claim 1, wherein the first and the second motion compensation interpolators respectively comprise: a first pixel reader to read the first pixel corresponding to the motion vector of the current block from the inputted current frame or field; a second pixel reader to read the second pixel corresponding to the motion vector of the current block from the inputted previous frame or field; a first and a second multiplier to multiply a relative location correlation coefficient between the current and the previous frame or fields and the frame or field to be interpolated by the read first and second pixels, and to output the result as a first and a second multiplication data; and a first adder to calculate the first interpolation pixel by adding the first and the second multiplication data outputted from the first and the second multipliers, wherein the sum of the relative location correlation coefficients which are respectively provided to the first and the second pixels is 1 (Heising, page 94, second paragraph on the right-hand column, see equation 1 on page 94; Heising, page 93, left-hand column, paragraph 1 to right-hand column, paragraph 1; Heising, page 94, left-hand column, paragraph 2 to page 95, right-hand column, paragraph 3; Heising, page 99, right-hand column, last paragraph -page 100, left-hand column, paragraph 1; Heising, Fig. 8; Choi, page 603, right-hand column, last paragraph to page 606, right-hand column, line 20; Fig. 2, 5-7)

Regarding claims 4 and 12, the combination of Choi and Heising discloses the motion compensation apparatus of claim 3, wherein the relative position correlation coefficient

is calculated by a following equation: r = (b/ a + b) where, r is the relative location correlation coefficient multiplied by the second pixel, a is a minimum distance between the frame or field to be interpolated and the previous frame or field, and b is a minimum distance between the frame or field to be interpolated and the current frame or field. While this is not explicitly disclosed in the references this equation, which is used to determine relative position correlation coefficient is well-known in the art and therefore would have been obvious to one of ordinary skill in the art to utilize (Official Notice).

Regarding claims 5 and 13, the combination of Choi and Heising discloses the motion compensation apparatus of claim 1, wherein the candidate interpolation pixel calculator comprises: a weight storage part storing weights allocated with respect to the relative locations of the pixels for interpolation in the current block, the weight storage part to read and provide the weight corresponding to positions where the calculated first and second interpolation pixels are interpolated, among the allocated weights; third and a fourth multiplier being provided with the weights corresponding to locations for interpolation of the first and the second interpolation pixels from the weight storage part, to multiply the weights by the first and the second interpolation pixels, and output as a third and a fourth multiplication data; and a second adder to calculate the candidate interpolation pixel by adding the third and the fourth multiplication data outputted from the third and the fourth multipliers, wherein the sum of the weights allocated to the first and the second interpolation pixels in the location where the first and second interpolation pixels are interpolated is 1 (Heising, page 94, second paragraph on the

right-hand column, see equation 1 on page 94; Heising, page 93, left-hand column, paragraph 1 to right-hand column, paragraph 1; Heising, page 94, left-hand column, paragraph 2 to page 95, right-hand column, paragraph 3; Heising, page 99, right-hand column, last paragraph -page 100, left-hand column, paragraph 1; Heising, Fig. 8; Choi, page 603, right-hand column, last paragraph to page 606, right-hand column, line 20; Fig. 2, 5-7).

Regarding claims 6 and 14, the combination of Choi and Heising discloses the motion compensation apparatus of claim 5, wherein the weight allocated to the first interpolation pixel decreases, and the weight allocated to the second interpolation pixel increases as the location for the first and the second interpolation pixels shifts from the center toward the border of the interpolated block (Choi, page 604, line 1-4)

Regarding claims 7 and 15, the combination of Choi and Heising discloses the motion compensation apparatus of claim 1, further comprising a delayer to delay the inputted current frame or field for a predetermined time, and to provide the delayed frame or field to the first and the second motion compensation interpolators and the motion compensation part (Heising, Fig. 5, "delay")

Regarding claims 8 and 16, the combination of Choi and Heising discloses the motion compensation apparatus of claim 1, wherein the number of the provided second motion

compensation interpolator is identical to the number of the peripheral blocks (Heising, page 95, right-hand column, paragraph 5).

Regarding claim 17, Choi discloses a block-based method of motion compensation, comprising: selecting areas of image blocks where block artifacts occur, and applying an overlap block motion compensation only to the selected areas (Choi, page 606, left column, lines 17-22) but does not disclose <u>selecting of the areas of the image blocks comprises selecting discontinuous area between blocks.</u>

Heising teaches wherein the selecting of the areas of the image blocks comprises selecting discontinuous area between blocks (Heising, page 93, lines 5 to 14 on the right-hand side).

Choi and Heising are both in the same field of endeavor of motion compensation. It, therefore, would have been obvious to one of ordinary skill in the art at the time of the invention to modify the Choi reference to include <u>selecting of the areas of the image blocks comprises selecting discontinuous area between blocks</u> as taught by Heising becauase “in the presence of objects performing different movements, motion discontinuities along object boundaries are not well represented.”

Regarding claim 18, Choi discloses a block-based motion compensation apparatus comprising: a first motion compensation interpolator to read a first and a second pixel corresponding to a motion vector of an estimated current block respectively from a

current and a previous frame or field inputted, and to calculate a first interpolation pixel; at least one second motion compensation interpolator to read a third and a fourth pixel corresponding to a motion vector estimated with respect to each of at least one peripheral block adjacent to the current block to be interpolated respectively from the inputted current and previous frame or fields (Choi, page 606, left column, lines 8-16; equation 10), and to calculate a second interpolation pixel; a candidate interpolation pixel calculator to calculate a candidate interpolation pixel by allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated (Choi, equation 12 wherein the weight is 0.5); a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous; and a final interpolation pixel selector to select one among the first interpolation pixel and the candidate interpolation pixel as a final interpolation pixel according to the result determined at the motion analyzer, and to output the selected final interpolation pixel (Choi, page 606, paragraph 1 on the right-hand side; equation 11-13; Fig. 7).

Choi does not disclose the following:

1) allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated;

2) a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous;

3)a final interpolation pixel selector to select according to the result determined at the motion analyzer

Heising teaches allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and the second interpolation pixels are interpolated, among the current blocks to be interpolated (Heising, page 95, left-hand side, lines 15-21, page 95, Fig. 2a and equation 3); a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks 9 (Heising, page 95, right column, lines 29-34, page 95, equation 4), and to determine whether the current block and the peripheral blocks are continuous; and a final interpolation pixel selector to select according to the result determined at the motion analyzer (Heising, page 95, right column, lines 35-36 and according to page 99, right column, lines 12-18 and page 100, left column, first paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Choi with the method of using a predetermined weighting, a

motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks and to determine whether the current block and the peripheral blocks are continuous, and subsequently a final interpolation pixel selector to select according to the result determined at the motion analyzer as taught by Heising for the objective of “significantly improving coding efficiency as well as visual quality" (Heising, page 93, first paragraph).

Regarding claim 20, the combination of Choi and Heising discloses the method of claim 17, wherein the selecting of the discontinuous areas comprises analyzing a deviation between motion vectors of a current block and peripheral blocks (Heising, page 95, lines 29-37 on the right-hand side).

Regarding claim 21, the combination of Choi and Heising discloses the method of claim 17, further comprising selectively applying the overlap block motion compensation to non-selected areas of the image blocks to reduce blurring (Heising, page 96, paragraph 3 on the right-hand side).

Claims 2 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi and Heising as applied to claim 1, further in view of Ohm.

Regarding claim 2 and 10, while the combination of Choi and Heising discloses the motion compensation apparatus of claim 1, the combination of Choi and Heising does

not disclose wherein the motion analyzer compares a deviation of the motion vectors of the current and the peripheral blocks, and when the deviation is equal to or larger than a preset threshold, outputs a signal to the final interpolation pixel selector indicating to select the candidate interpolation pixel calculated from the candidate interpolation pixel calculator as a final interpolation pixel, and when the deviation is smaller than the preset threshold, outputs a signal indicating to select the first interpolation pixel calculated from the first motion compensation interpolator as a final interpolation pixel.

Ohm teaches wherein the motion analyzer compares a deviation of the motion vectors of the current and the peripheral blocks, and when the deviation is equal to or larger than a preset threshold, outputs a signal to the final interpolation pixel selector indicating to select the candidate interpolation pixel calculated from the candidate interpolation pixel calculator as a final interpolation pixel, and when the deviation is smaller than the preset threshold, outputs a signal indicating to select the first interpolation pixel calculated from the first motion compensation interpolator as a final interpolation pixel (Ohm, page 3, last six sentences of the left hand column to the first five sentences of the right hand column).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Choi and Heising to include the method of Ohm in order to "overcome the inexact description of the motion vector field" by using an approach for “taking into account features from the neighborhood” (Ohm, abstract) and more

specifically, to make use of the fact that “high differences of motion vectors usually indicate the presence of an object border” as discussed starting at the 8th line up from the bottom of the left hand column of page 3.

Response to Arguments

Applicant’s Argument:

“Although Choi discloses an overlapped block motion compensation (OBMC) technique to reduce the block artifacts, Choi fails to show the Applicants discontinuous area as recited in the amended independent claim 17” (Remarks, page 9, fourth paragraph).

Examiner’s Reply:

The limitations of the amended independent claim are met by the combination of Choi and Heising wherein the selecting of the areas of the image blocks comprises selecting discontinuous area between blocks as shown on page 93, lines 5 to 14 on the right-hand side of the Heising reference (as previously discussed in former claim 19).

Applicant’s Argument:

“In particular, Heisinq does not teach or suggest "allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and second interpolation pixels are interpolated, among the current blocks to be interpolated" (Remarks, page 10, fourth paragraph).

Examiner's Reply:

Figure 1 which illustrates "spatial interpolation of motion vectors" and Figure 2 which shows "2-D weighting function for OBMC-based prediction".

Applicant's Argument:

"Neither does Heising teach or suggest "a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous" (Remarks, page 11, first paragraph).

Examiner's Reply:

The decision whether to use warping prediction or OBMC for a block, which depends on whether the blocks are continuous, depends on equation 4 of the Heising reference. Also, on page 93, right column, first paragraph, Heising discusses how "motion discontinuities are not well represented in the image warping model" and how OBMC "offers an instrument for a better prediction by means of a superposition of overlapping displaced blocks from the reference frame".

Applicant's Argument:

“Finally, Heising does not teach or suggest "a final interpolation pixel selector to select according to the result determined at the motion analyzer" (Remarks, page 11, second paragraph).

Examiner’s Reply:

The result of the motion analysis is also used to select between OBMC and BMC as shown on page 100, left column, first paragraph of the Heising reference.

Applicant’s Argument:

‘In particular, Heisinq does not teach or suggest "allocating a predetermined weight to the first and the second interpolation pixels according to relative locations where the first and second interpolation pixels are interpolated, among the current blocks to be interpolated" (Remarks, page 12, pargraph 3).

Examiner’s Reply:

Figure 1 which illustrates “spatial interpolation of motion vectors” and Figure 2 which shows “2-D weighting function for OBMC-based prediction”

Applicant's Argument:

"Neither does Heising teach or suggest "a motion analyzer to analyze the estimated motion vectors of the current block and the peripheral blocks, and to determine whether the current block and the peripheral blocks are continuous" (Remarks, page 12, last paragraph).

Examiner's Reply:

The decision whether to use warping prediction or OBMC for a block, which depends on whether the blocks are continuous, depends on equation 4 of the Heising reference. Also, on page 93, right column, first paragraph, Heising discusses how "motion discontinuities are not well represented in the image warping model" and how OBMC "offers an instrument for a better prediction by means of a superposition of overlapping displaced blocks from the reference frame".

Applicant's Argument: :

"Finally, Heising does not teach or suggest "a final interpolation pixel selector to select according to the result determined at the motion analyzer" (Remarks, page 13, second paragraph).

Examiner's Reply:

The result of the motion analysis is also used to select between OBMC and BMC as shown on page 100, left column, first paragraph of the Heising reference.

Applicant's Argument:

Applicant states that "the Examiner's cited reference cannot satisfy the limitation of claim 20 for 'selecting discontinuous areas between blocks' " (Remarks, page 13, paragraph 5).

Examiner's Reply:

Equation 4 on page 95 of the Heising reference is used in the decision on whether to use warping prediction or OBMC for a block, which depends on whether the blocks are continuous, depends on equation 4 of the Heising reference. Also, on page 93, right column, first paragraph, Heising discusses how "motion discontinuities are not well represented in the image warping model" and how OBMC "offers an instrument for a better prediction by means of a superposition of overlapping displaced blocks from the reference frame". OBMC is used, in the presence of motion discontinuities, to reduce blocking artifacts. Applicant is also directed to page 93, left column, last paragraph to right column, first paragraph and page 95, left column lines 11-21, wherein OBMC is used, in the presence of motion discontinuities.

Applicant's Argument:

Applicant states that "there is no teaching or suggestion of 'selectively applying the overlap block motion compensation to non-selected areas of the image blocks to reduce blurring, as required by claim 21" (Remarks, page 13, last paragraph).

Examiner's Reply:

Applicant is directed to page 96, right column, paragraph 3, where after a quadtree block segmentation for every subblock the motion model to be used is refined, thereby some previously unselected blocks (for OBMC) will be selected for OBMC.

Applicant's Argument:

Applicant argues that "the Examiner's cited reference cannot satisfy the limitation of claim 20 for 'selecting discontinuous areas between blocks' ".

Examiner's Reply:

Applicant is directed to page 93, right column, lines 5-14 of the Heising reference and also on page 93, left column, last paragraph to right column, first paragraph and page 95, left column lines 11-21, wherein OBMC is used, in the presence of motion discontinuities.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELISA M. RICE whose telephone number is (571)270-1582. The examiner can normally be reached on 12:00-8:30p.m. EST Monday thru Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571)272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elisa M Rice/
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